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## ABSTRACT

Study of material and thickness variations have been carried out at the moderator using MCNPX simulation. This simulation aims to determine the material and thickness optimization which can be used for research development. Materials used in this study are Pb and Bi materials for reflectors, and Fe and  $\text{AlF}_3$  for fast neutron filters. Based on the simulation that has been carried out with a variation of the thickness of the Pb reflector material, with the addition of a gamma filter placed in front of the aperture. The number of neutron fluxes coming out of the beam guide is  $1.64885 \times 10^{10} \text{ n. cm}^{-2} \cdot \text{S}^{-1}$ , and optimum reflector material thickness is 36 cm Pb material, because Pb reflected the neutron and multiplied the neutrons that produced due to the collision of proton with Be. Other than that, Pb material is easily obtained on the market, making it more economical in its manufacture. Shielding thickness variations were also performed with detector cells located on the outer surface of the wall with barite concrete material of  $2.35 \text{ g / cm}^3$ , a variation of thickness were 30 cm, 60 cm, 90 cm, 120 cm, 150 cm, 180 cm, 210 cm, 240 cm and 250 cm. The simulation results show that the shielding thickness of 180 cm has been able to absorb the gamma dose produced during irradiation. This is useful as a reference for future simulation research and will also be more economical in terms of location and materials which will certainly saving costs.

Keywords: simulation, moderator, MCNPX, lead (Pb), shielding